



Armed Forces College of Medicine AFCM



Gastric Motility

By

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INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

- ✓ **Mention motor functions of the stomach**
- ✓ **Describe receptive relaxation of stomach**
- ✓ **Describe the mixing & propulsive function of the stomach**
- ✓ **Explain regulation of gastric evacuation**
- ✓ **Describe mechanism of vomiting**
- ✓ **Mention causes and effects of vomiting**

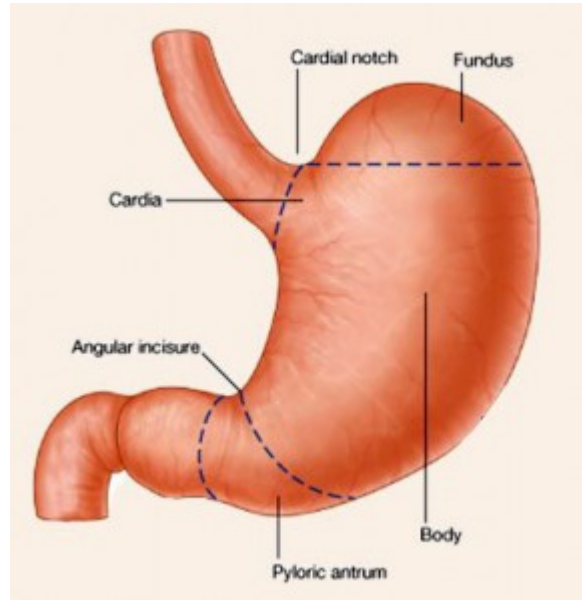
Stomach



Motility

- ✓ Storage
- ✓ Mixing
- ✓ Emptying

Secretory



Digestive

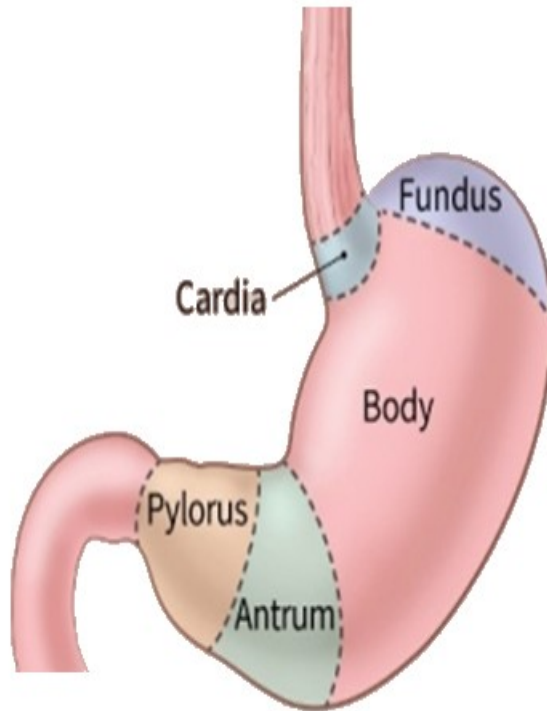


Thick liquid mixture known as **Chyme**

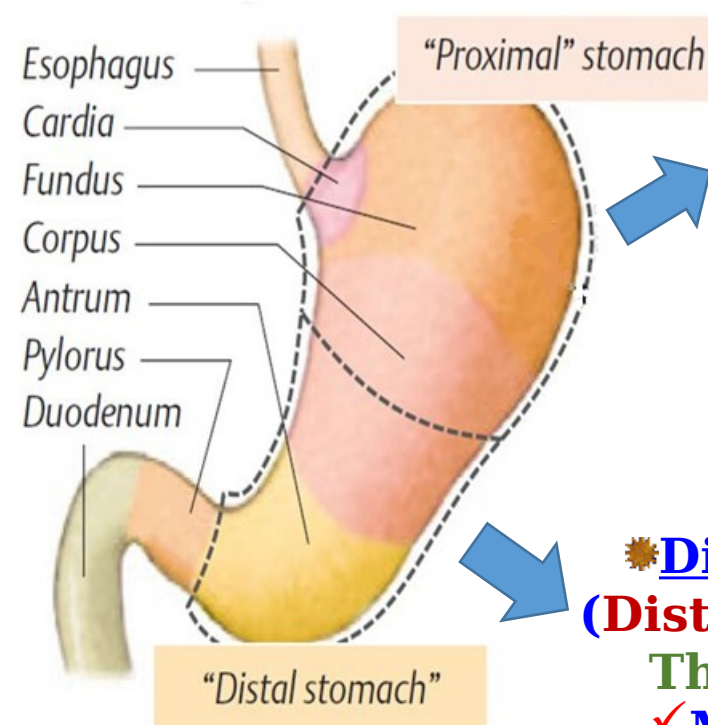
Stomach



Anatomically



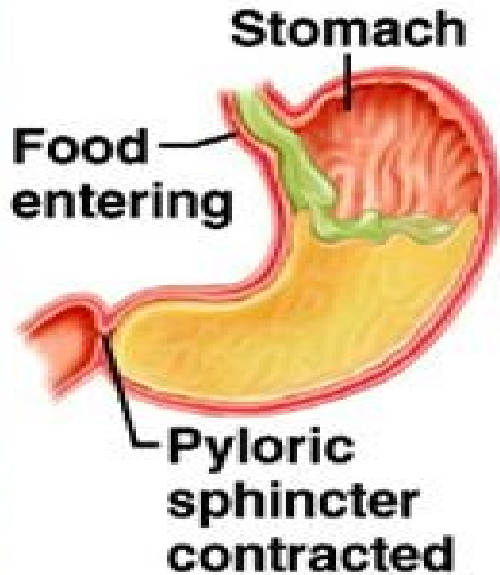
Physiologically



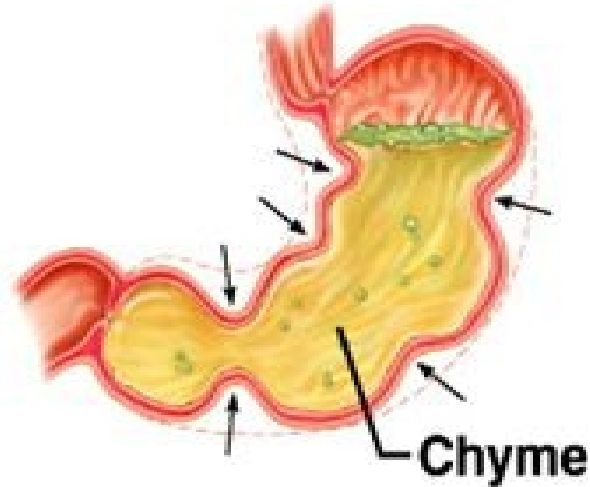
☀ **Proximal motor unit (Fundus & proximal body)**
Thin wall
✓ **Storage of food**
“Receptive relaxation”

☀ **Distal motor unit (Distal body & antrum)**
Thick muscle wall
✓ **Mixing & partial digestion of food to form chyme**
✓ **Propelling & emptying of chyme into duodenum**

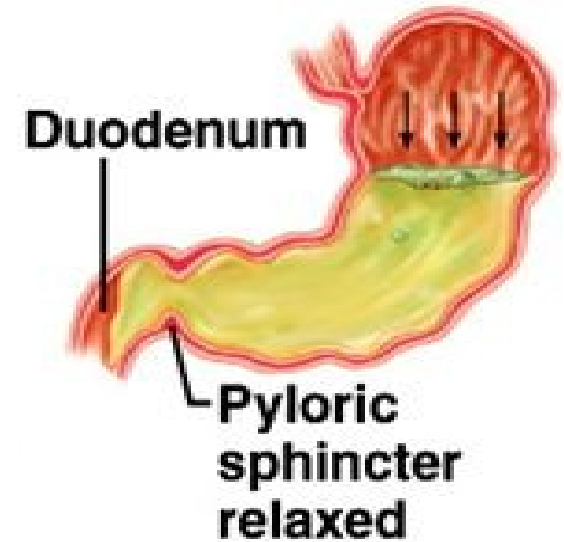
Motor functions of the stomach



Storage of food



Mixing & partial digestion of food to form chyme



Slow emptying of chyme into duodenum

Storage Function of the Stomach



Receptive Relaxation

Arrival of food into stomach initiates a reflex relaxation of stomach

Empty Stomach
(50 ml)



↑ Stomach capacity
(1-1.5 liters)

Can accommodate it with
little ↑ in intra-gastric pressure



the function of the proximal motor unit
mechanism □□

○ **Nervous (Vago -Vagal Reflex)**

○ The relaxation is also triggered by movement of pharynx and esophagus during swallow

Over distended stomach ↑↑ intra-gastric pressure → Discomfort

Quiz



Which of the following abolishes “receptive relaxation” of the stomach?

- A. Parasympathetic stimulation
- B. Sympathetic stimulation
- C. Vagotomy
- D. Administration of gastrin
- E. Administration of vasoactive intestinal Peptide (VIP)
- F. Administration of cholecystokinin (CCK)

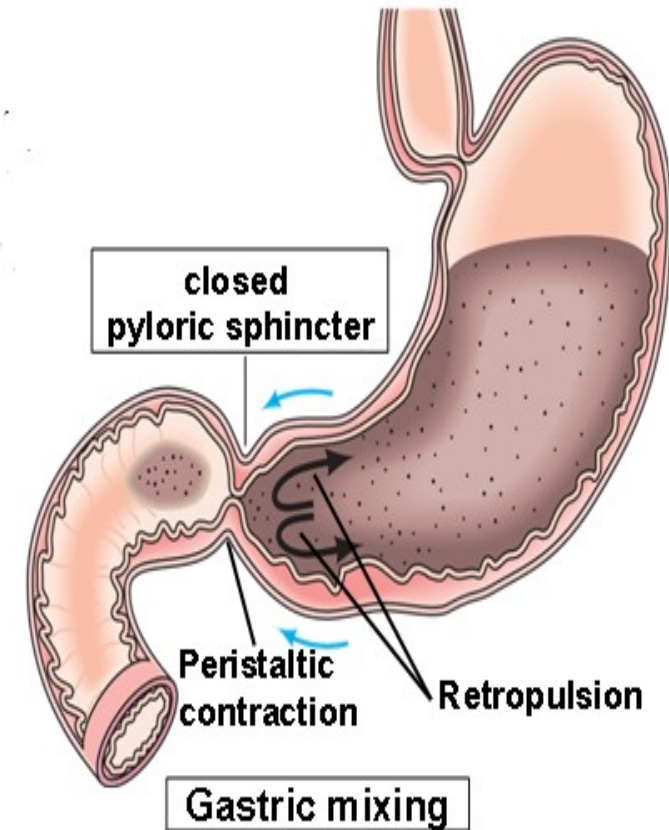
Mixing and Propulsion of Food in the Stomach



Gastric peristaltic contractions begin in the middle of the body & travel towards the pylorus, with ↑ in the force of contraction



- Mix gastric contents & periodically propel a portion of gastric contents through pylorus into duodenum
- Most of the gastric contents are propelled back into stomach for further mixing



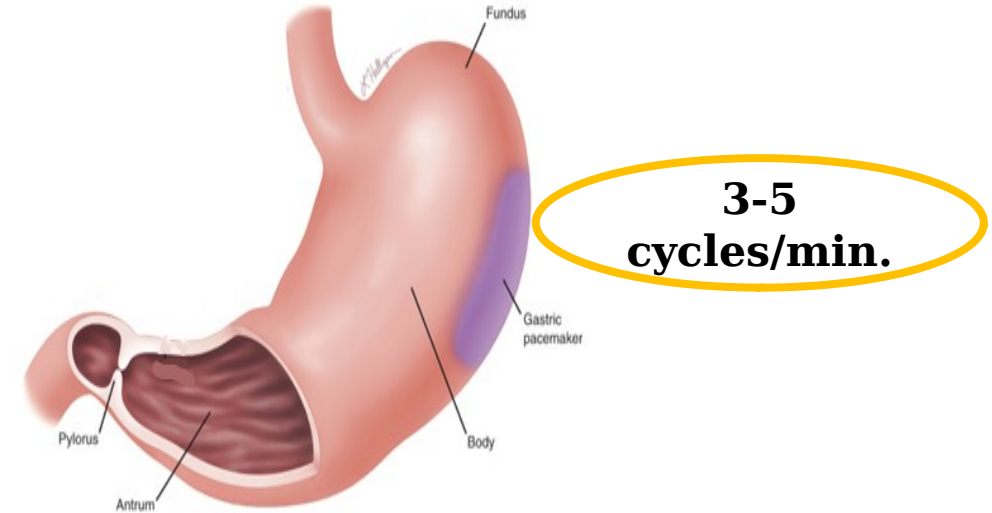
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Retropulsion

Mixing and Propulsion of Food in the Stomach



Waves of contraction are initiated
by the "**Basic Electrical
Rhythm**"
=Gastric Slow Waves
(*They start at the pace maker of the
stomach*)



frequency of action potentials & force of gastric contraction

🌀↑ **By Vagal stimulation & gastrin hormone**

🌀↓ **By Sympathetic stimulation, GIP &
secretin hormone**

Gastric Emptying



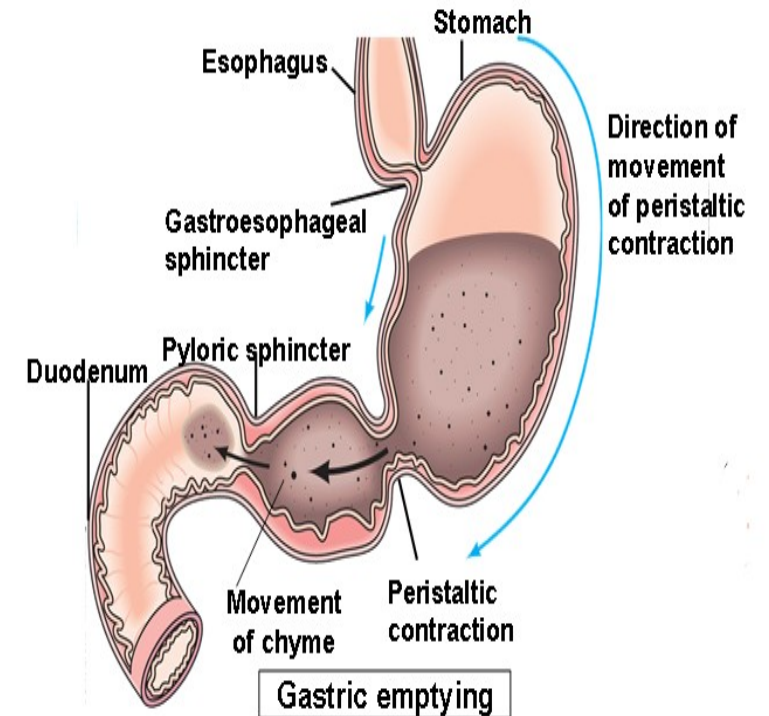
Stomach empties slowly into duodenum
Complete emptying “*usually 3-4 hours after a meal*”

Antrum, pylorus & upper duodenum

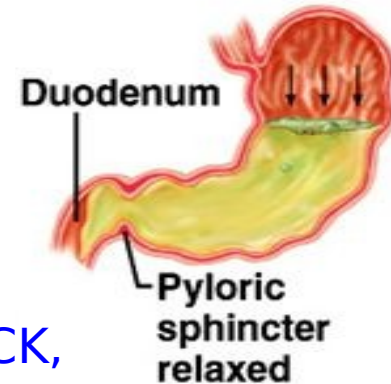
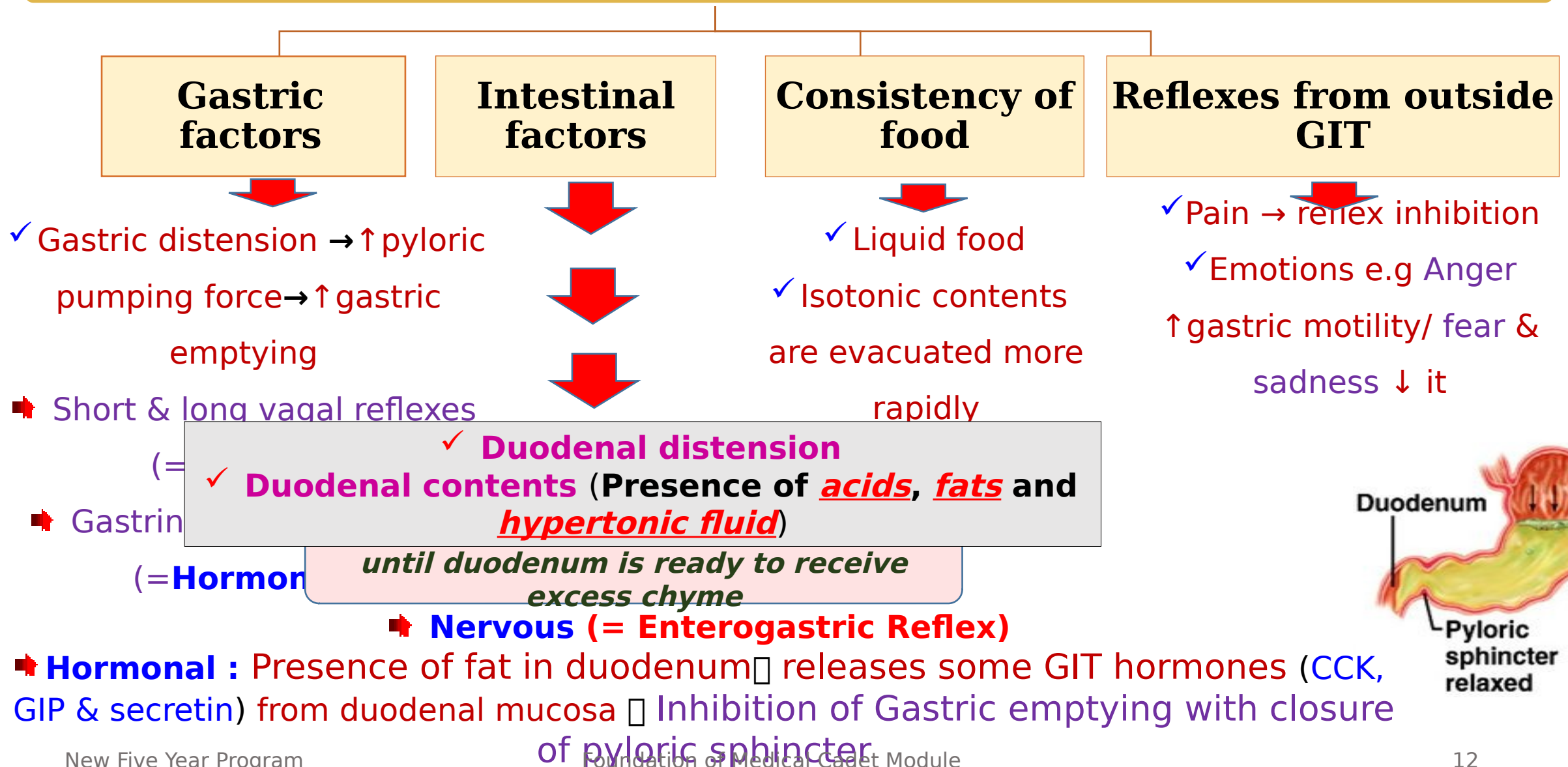
function as 1 unit

✓ Antroduodenal contraction is followed by sequential contraction of the pyloric region “tends to persist longer” → *Preventing regurgitation from the duodenum into stomach*

“Also CCK & secretin + + pyloric sphincter”



Regulation of Gastric Emptying



Abnormality of Gastric Motility



1- **Hunger contractions** (= *Hunger pains*)

Associated with hunger & fasting



Hypoglycemia



**↑ Activity of Feeding
Centre**



sends impulses to:

**Limbic cortex giving
the hunger
sensation**

**Vagal nucleus in the
medulla**

Abnormality of Gastric Motility



2- Vomiting (= *Emesis*)

Vomiting is a protective mechanism, to protect GIT against toxic or irritant substances

It is initiated by stimulation of receptors inside GIT OR outside GIT
→ autonomic nerves

→ ++ Vomiting Center in medulla → efferent impulses to upper GIT, diaphragm & abdominal muscles, to initiate vomiting act

The major force for expulsion of vomitus comes from contraction of diaphragm & abdominal muscles

➤ The stomach, esophagus, and LES are all **RELAXED** during vomiting

➤ The stomach itself **does not actively participate** in the act of vomiting



Reflex

- ✓ touching back of throat
- ✓ Irritation or distension of stomach or duodenum

Forceful expulsion of gastric content out through the mouth

Preceded by profuse salivation, nausea, tachycardia & sweating

Pyloric orifice contracts



Motion sickness

Chemicals, drugs

Central

Chemoreceptor Trigger Zone

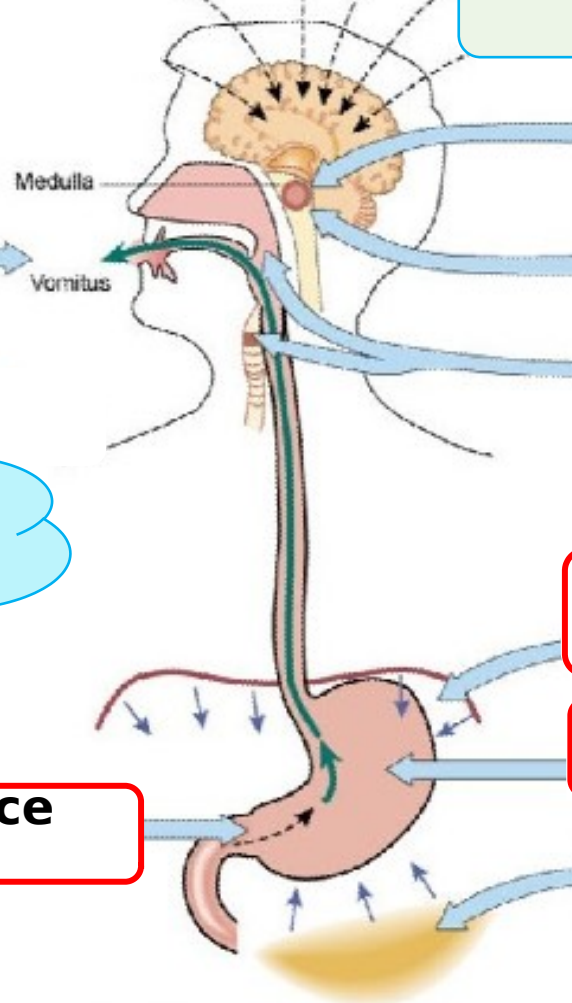
Vomiting Center

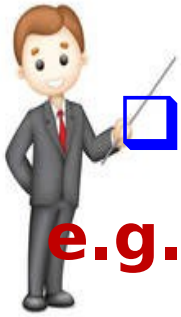
Glottis closes & soft palate rises **Closing off airways**

Strong Contraction of the Diaphragm

LES & fundus relax

Abdominal ms contract forcefully





Certain circulating chemical agents can initiate vomiting
e.g. Chemotherapeutics used in cancer, uremia & apomorphine

HOW ?

Chemicals 1st stimulate a nearby area in medulla
= Chemoreceptor Trigger Zone “CTZ”

Chemoreceptor Trigger Zone



Vomiting in early pregnancy (Hormones) & uremia is due to stimulation of CTZ



□ Rapid changes in direction of the head → ***Labyrinthine stimulation***

+ ***Vomiting center*** = ***Motion sickness***

□ **Excessive vomiting**

▶ ***Dehydration***

▶ ***Hypokalemia***

▶ ***Metabolic alkalosis*** (***Loss of gastric acid*** → ↓ ↓ *H⁺ conc. in blood*)

Lecture Quiz



Question 1

Which of the following is the major stimulus for receptive relaxation of the stomach?

- A. Food in the stomach
- B. Food in the intestine
- C. Secretin
- D. Cholecystokinin (CCK)
- E. Motilin



Question 2

Which of the following will inhibit stomach contraction?

- A. Acetylcholine
- B. Gastrin
- C. Secretin
- D. Motilin
- E. Histamine



Question 3

The act of vomiting:

- A. Is produced mainly by contraction of gastric musculature
- B. Is coordinated by a spinal cord center
- C. Involves relaxation of the diaphragm
- D. Begins with deep inspiration and closure of the glottis
- E. May lead to metabolic acidosis, if prolonged

SUGGESTED TEXTBOOKS



- 1. Guyton and Hall.** *Text book of Medical Physiology, 13th Edition*
- 2. Ganong's** *Review of Medical Physiology, 25th Edition*
- 3. Sherwood.** *Human Physiology From Cells to*

